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Army Research Institute Validation-Estimation System (ARIVES) User's Manual

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Manned Systems Group
Systems Research Laboratory

U.S. Army Research Institute for the Behavioral and Social Sciences

U.S. ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES

A Field Operating Agency Under the Jurisdiction of the Deputy Chief of Staff for Personnel

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The existence of an accurate task analysis is a fundamental requirement for developing and evaluating training, function allocations, person-machine interfaces, personnel and manpower requirements, and test plans. To develop an accurate task analysis, one must identify missions, functions, tasks, and conditions that apply to a system; determine how these applicable items relate to each other; and validate the related, applicable items that have been identified.

ARIVES (Army Research Institute Validation-Estimation System) is a method that uses a computer network to create and validate hierarchical task analyses. It is designed to reduce the time and difficulty of data collection and analysis and runs on a VAX minicomputer. This document is the ARIVES User's Manual.

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Army Research Institute Validation-Estimation System (ARIVES) User's Manual

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FOREWORD

The successful integration of soldiers, training, and equipment should be based on an agreed upon, detailed, hierarchical description of what those soldiers have to do in the use of that equipment. The process of developing and agreeing upon such a performance description is time consuming and expensive.

The U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) has developed a software-based system called ARIVES (Army Research Institute Validation-Estimation System) to aid the process. ARIVES is intended to be used by personnel who are developing task analyses and allows its users to collect and validate performance descriptions. It provides the following:

(a) A database management system into which initial performance descriptions can be placed;

(b) Detailed examples of initial performance hierarchies;

(c) A facility to send performance hierarchies to multiple subject matter experts along a computer network;

(d) Facilities to collect the opinions of subject matter experts and transmit them to a common database; and

(e) An analysis facility that automatically keeps track of subject matter expert responses and provides statistical data about them.

This work was conceived and originally designed by the Manned Systems Group (MSG) and funded by the Information Systems Command.

EDGAR M. JOHNSON
Technical Director

ARMY RESEARCH INSTITUTE VALIDATION-ESTIMATION SYSTEM (ARIVES)
USER'S MANUAL

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ARMY RESEARCH INSTITUTE VALIDATION-ESTIMATION SYSTEM (ARIVES) USER'S MANUAL

INTRODUCTION

The existence of an accurate task analysis is a fundamental requirement for developing and evaluating training, function allocations, person-machine interfaces, personnel and manpower requirements, and test plans. To develop an accurate task analysis, you have to identify missions, functions, tasks, conditions that apply to a system; determine how these applicable items relate to each other; and validate the related, applicable items you have identified.

Developing a reasonably accurate task analysis is time consuming. It is done by observing people at work, by doing face-to-face interviews with subject matter experts (SMEs), or by developing and mailing questionnaires to SMEs.

The first approach requires the observers to travel to multiple locations, recognize what they are seeing, and have a fairly large number of systems and personnel available for the observation process. Further, the act of observation tends to alter the process being observed.

The second approach requires one or more trained interviewers with a background in the process being studied and the time and money it takes to go to where SMEs can be found. This approach requires access to a fairly large number of SMEs who are willing to be interviewed for a protracted period and who can verbally recall the process being studied.

The third approach is the most commonly followed. It requires the development of a questionnaire, knowledge of the process being studied, and considerable cooperation from SMEs who respond by mail. Typically, this cooperation is difficult to gain from an adequate number of SMEs due to the onerousness of the paper-and-pencil questionnaire process.

All three approaches require the analysis of a body of task analysis data taken from a large enough number of observations or SMEs to assure accuracy. The first two require expensive travel and a great deal of cooperation, but usually are productive. The third requires no travel but often produces doubtful results due to small numbers of fully completed responses. All three take long periods of time to implement.

The development of computers permits the creation of more easily used interactive questionnaires and data analysis techniques. The development of computer networks and the inexpensive availability of computer modems permit rapid access of multiple SMEs to such interactive questionnaires.

Normally, task analyses are organized as hierarchically connected sets of missions, functions, tasks, and conditions in accordance with MIL-H-46855. The Army Research Institute Validation Estimating System (ARIVES) is a method for quickly building and validating a task analysis in the form of such a hierarchy. This is done using a computer network, such as the Defense Network (DDN), as a communications medium with multiple subject matter experts (SMEs).

The people who control ARIVES are called analysts in this Guide. It is assumed that an ARIVES analyst knows something about task analysis in general, and has access to preliminary information about performance in the kind of system for which the analysis is to be done.

ARIVES provides analysts with a facility to create the first draft of performance hierarchies that can be viewed and altered by SMEs. It includes existing hierarchies for armor, infantry, and artillery which can serve as examples, or be used directly. It provides a method for SMEs to move through the computerized performance hierarchy--deleting, changing, and adding linked missions, functions, tasks, and conditions, thus building and validating a task analysis. It allows analysts to view each SMEs results and automatically computes statistics across SMEs. It permits analysts to alter the initial performance hierarchy, according to the views of the SMEs, and if desired, to recycle the entire procedure in the manner of the DELPHI technique.

ARIVES Bases

ARIVES is based on five assumptions. (1) The most cost- and time-effective way to collect, fine tune and validate performance hierarchies is by using SMEs. (2) SMEs are able to recognize, change, or delete missions, functions, and tasks, but they have great difficulty in generating or recalling them. (3) Typical task lists produced by SMEs emphasize external, observable tasks and avoid internal, cognitive tasks, even when these are critical. (4) It is preferable to have a large number of SMEs if you want performance that is described accurately and is acceptable to users. (5) Presenting SMEs with performance hierarchies in the form of masses of paper often results in noncompliance and pro forma responses.

The hardware and software requirements to run this version of ARIVES (1.0) are as follows:
1. Runs on VAX computer (developed on VAX 11/785).
2. Runs under operating system-VMS 4.5-4.7. It may run under 4.0-4.4. It will not run under VMS 3.7 or lower.
3. It requires approximately 5000 blocks of disk storage for each SME.

4. It requires approximately 30,000 blocks of disk storage for ARIVES software and the three taxonomies that are provided.

The ARIVES Performance Hierarchy

In ARIVES, you can create new performance hierarchies from scratch, use existing hierarchies without change, or edit existing hierarchies. When you create or edit a hierarchy, you have considerable freedom of action. That is, you can put in whatever words you want, but the overall structure of an ARIVES hierarchy produces some logical limits on your decisions. These limits are described below.

The general structure of the ARIVES hierarchy consists of the linking of missions to functions, functions to operations and maintenance tasks, and groups of tasks to relevant conditions. The following figure portrays the ARIVES hierarchy.

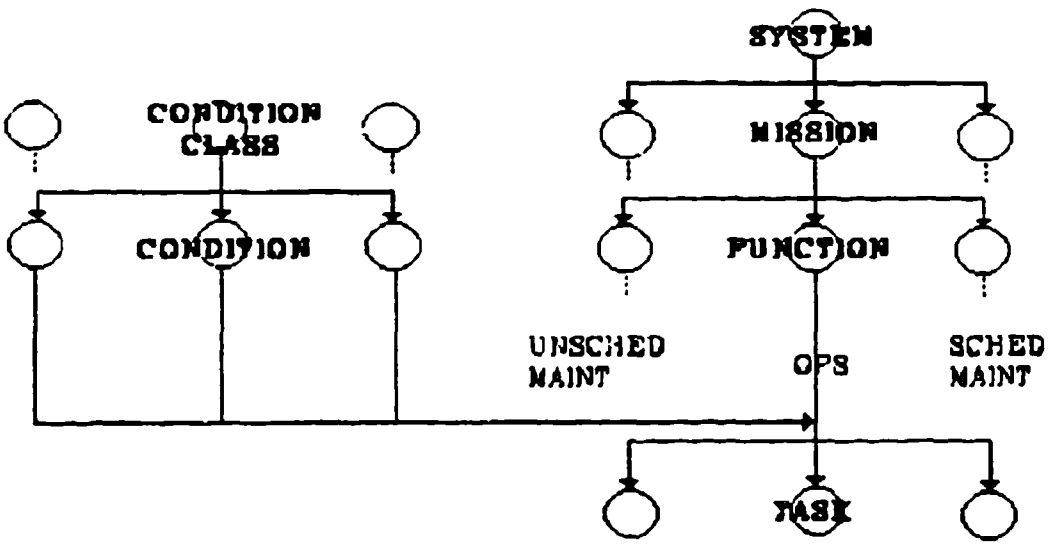


Figure 1. Structure of the ARIVES Performance Hierarchy

A performance hierarchy in ARIVES is specific to a system class, for example armor, infantry, artillery, command and control, etc. Within a system-based hierarchy, the highest level of performance is called a mission. Missions always consist of nouns and verbs. As a general rule, they do not have adjectives or adverbs. Adjectives are words that modify the nouns. This type of modification is reserved for the part of the performance hierarchy called conditions. In ARIVES, conditions can be attached to groups of operational and maintenance tasks. They cannot be attached to missions. Adverbs are words that modify verbs, such as quickly, slowly, etc. In fact, an adverb is a kind of fuzzy performance criterion. You can include them if you want,

but if you intend to attach objectively measurable performance criteria to an ARIVES hierarchy, including adverbs will be redundant and as a result may lead to logical difficulty.

Missions

In the three hierarchies that have been included with ARIVES, missions take the form of a verb plus a direct object, for example "Destroy tanks." From time to time, the general rule against the inclusion of adjectives has been broken in the existing hierarchies. For example, you will see the word "enemy" as in "Destroy enemy tanks." Usually, this was done when such an adjective was necessary for clarity and is present uniformly.

Functions

Each mission in a hierarchy decomposes into its component operational functions. A function is written in the same general format as a mission. To start with it consists of nouns and verbs, but it does not have adjectives or adverbs. ARIVES has its users select or write these kinds of functions and then separately append conditions, because it is easier for people to make several simple decisions than one complex decision.

Tasks

Each operational function may be decomposed into three types of tasks--operational, scheduled maintenance, and unscheduled maintenance. All types of tasks follow the same format as functions. Decomposing operational functions into operational tasks is traditional and requires no explanation. However, decomposing operational functions into maintenance tasks is unusual currently and requires additional explanation.

The typical position at present is to build two independent and unrelated performance hierarchies for a system, one for operations and the second for maintenance, or in some cases for logistics with maintenance as a subset.

There are two problems with this approach. The first problem is that maintenance tasks become relatively unimportant when they are decoupled from operations. Systems are acquired for their operations capabilities. Their maintenance and other logistics capabilities are important only in so far as they support operations. When this logical connection is hidden by the creation of separate performance hierarchies, the real importance of maintenance and logistics is lost.

The second problem is that normally maintenance tasks are connected to descriptors of the appropriate hardware subsystems or components upon which they act. Task analyses can make some of their most significant contributions to the acquisition process before initial system design. Before design, one has a choice of connecting maintenance tasks to descriptors of historical or comparable components or subsystems, or to the operations functions that those subsystems would have performed. Developing a generic performance hierarchy based upon comparable subsystems or components is a major undertaking.

Since the purpose of ARIVES is to make this process shorter and easier, maintenance tasks were connected to operations functions. This simplifies the analyst's work and avoids the problem of the relative importance of operations vs. maintenance.

Conditions

In ARIVES each of the three sets of tasks (operational, scheduled maintenance, and unscheduled maintenance) that has been decomposed from a given function is assigned its own conditions. For purposes of indexing, conditions are collected into condition classes. It should be noted that conditions include enemy and friendly tactics as well as the environment. This permits conditions to be used to create operational or maintenance scenarios that are linked to tasks.

It probably would be more accurate to provide for the linking of conditions to individual tasks rather than a whole set of tasks. However, the number of decisions required for such individual linkings would be so large that the chance of getting SMEs to review or alter them is negligible. For example, if one were to assume ten functions, and each function had twenty tasks, and there were 100 potential conditions, 20,000 decisions would have to be made by each SME. On the other hand, the ARIVES method reduces this number to 200. It is possible that all the tasks that are performed at one time within a given function might not be performed under the same set of conditions. However, it is unlikely that this happens often.

GETTING STARTED USING ARIVES

ARIVES comes with three complete performance hierarchies (armor, artillery, infantry). To familiarize yourself with ARIVES, choose one of them and browse through it.

Before you start remember that ARIVES provides its user with routines to build the first draft of a performance hierarchy from scratch or by adapting an existing hierarchy; enroll

SMEs to provide them access to that hierarchy; allow SMEs to to alter it; collect all their views in a database; compute statistics on SMEs views; allow the analyst to view all SME input and statistics; and alter the master version of the hierarchy. However, to use ARIVES, it must be present on your VAX, and you must have an account on that VAX. If it is not present, you must get a copy of the ARIVES magnetic tape and "ARIVES System Manager Guide." Take these to the system manager of your VAX.

To start ARIVES, follow these steps:

1. Sign on the VAX.

2. Enter "@ARIVES" at the $ prompt. You use @ARIVES only the first time you start ARIVES in a given VAX session. In a given VAX session once you exit ARIVES, to restart it you must enter "SET DEFAULT ARIVES_DIR".

3. You will see some messages that say that various previous values of some ARIVES files have been superceded. This is a normal ARIVES process. You are now in the working area in which ARIVES resides. If you wish, you can look at the various ARIVES files by entering "DIR". These files will include the existing hierarchies for armor, artillery, and infantry. You now need to access one of these hierarchies.

4. At the $ prompt enter "LOAD ARMOR" (or infantry, or artillery).

5. You will now see the ARIVES title screen. Hit any key to continue.

6. At the next screen, you can direct ARIVES to start at the top of the selected hierarchy, or if you have been in this hierarchy before, you reenter and go directly to the screen from which you exited. Press any key to start at the top of the hierarchy. Press "Y" for yes to start where you exited.

To understand the use of the reenter feature, imagine you were working on the operational tasks of the fourth function of the seventh mission when you had to end a session. You might want to start the next session at this same screen. When you log into ARIVES, a message appears that asks if you want to start at the point from which you exited. If you press the "Y" key for yes, you will start at the appropriate operational task screen. There may be a slight delay while the system is going to this point. If you press anything else, such as the "RETURN" key, you will start at the mission screen.

7. As a result of step 5, ARIVES will send you to the MAIN MENU for the top of the hierarchy or for that part of the

hierarchy from which you exited. By using the commands in this menu, you can edit any existing hierarchy. This is what the ARIVES Main Menu looks like. The commands on this menu are the keys to editing an existing hierarchy or building a new one.

MAIN-MENU enter a key	
A:	add new item to list
C:	change item in list
D:	delete item in list
E:	exit from ARIVES
K:	kill copy subtree
L:	go to the next level
M:	move item in list
O:	display original data
R:	return to previous level
S:	copy subtree
T:	copy text to list
V:	view current list
?:	get help

8. You can enter one of the main-menu commands either from the menu or from any of the mission, function, etc. screens. To enter a command press the indicated key, and the press the "RETURN" key.

9. If you are looking at a list of missions, functions, etc., and you wish to see the Main Menu, you should enter the "SPACE-BAR" at the bottom of the keyboard.

To browse through ARIVES, you will need only the V View) command to see the list of missions, functions, tasks, or conditions at any particular level of the hierarchy, and the L (Level) command to move up and down in the hierarchy. For a description of the commands in this menu, see pp. 9-13.

CREATING A NEW HIERARCHY

Hierarchies have names ("Armor") and data. Creating a new taxonomy can require defining a new name, new data, or both. If you want to define both, you will find instructions in "Creating a New System Hierarchy from Scratch." If you want to copy an existing hierarchy and edit it, but rename it (e.g., changing "aAmor" to "IFV"), you will find instructions in "Using Existing Data with a New System Name."

Creating a New System Hierarchy from Scratch

If you want to create a new system without making use of any other hierarchy's data, use the following steps.

1. Sign on the VAX.

2. Enter "@ARIVES" at the $ prompt. You use @ARIVES only the first time you start ARIVES in a given VAX session. In a given VAX session once you exit ARIVES, to restart it you must enter "SET DEFAULT ARIVES_DIR".

3. You will see some messages that say that various previous values of some ARIVES files have been superseded. This is a normal ARIVES process. You are now in the working area in which ARIVES resides.

4. Run the CDB program. If the category is SPECIAL_OPS, for example, enter "CDB SPECIAL_OPS". This will create an empty data base for the system category SPECIAL_OPS. *Names of such files cannot have blank spaces, so you have to connect separate words with an underline.*

5. Run the LOAD program. If the category is SPECIAL_OPS, for example, you enter "LOAD SPECIAL_OPS", and "RETURN". This will provide you with the same screens and editing facilities as you have when you alter an existing hierarchy. See the previous section for a description of these facilities.

6. Entering a very large number of missions, functions, tasks, and conditions is tedious, particularly when a number of these items are repeated over and over again. ARIVES provides a subtree copy feature to reduce the amount of text entry required. This feature allows you to select a subtree at the mission or function level and copy it in one command. After copying it, you can use the change, add, and delete features to edit the new subtree.

Since this feature works at the mission and function levels, a reasonable strategy would be to add a new mission, and then add to it the function that is the most general in terms of its tasks and conditions. Next, use the subtree copy feature to copy the function, its tasks, and conditions as many times as you have similar functions. Edit each function, and its tasks and conditions. When you have completed one full mission subtree, you add a second mission. If the new mission has functions, tasks, and conditions similar to the previous one, you copy its whole subtree structure and edit. If some of the new mission's functions are similar, but not all, you copy the similar function subtrees and edit. Then you add new functions. The new, dissimilar functions will have to have their own tasks and conditions added.

Maintenance tasks consist of a constant list of verbs, and conditions are likely to be identical across functions for any given mission. That being the case, it is suggested that even if the operations tasks of a given function are different from one you have already entered, you make use of the subtree copy feature. It is easier to change or delete some operations tasks and add new ones, than it is to add a whole maintenance task structure or conditions structure.

Using Existing Data with a New System Name

If you think that most of the missions, functions, etc. of a new hierarchy are identical to an existing one, the best approach is to copy the existing one and rename it. Then you can edit your new hierarchy. If you want to copy and rename an existing hierarchy, use the following steps.

1. Sign on the VAX.

2. Enter "@ ARIVES" or "SET DEFAULT ARIVES_DIR", as appropriate, to get to the ARIVES Directory.

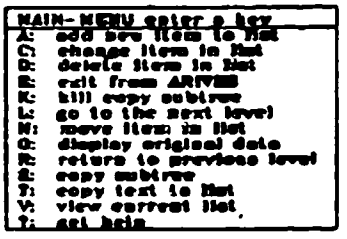
3. Enter "CREATE/DIR [.NEW_NAME]" where NEW_NAME is the name of your new hierarchy. Make sure to leave spaces just as shown in this step. If your new name has more than one word, you will have to connect the words with an underline as shown.

4. Enter "SET DEFAULT [.NEW_NAME]" where NEW_NAME is the name you entered in step 3.

5. Enter "COPY [-.NAME_TO_BE_COPIED]*.* []" where NAME_TO_BE_COPIED is the name of the existing hierarchy that you are copying.

6. Enter "LOAD NAME" where name is the name you entered in steps 3 and 4. Now you have an old hierarchy with a new name, and you can edit it at will.

The following descriptions tell how to use each of the Main-Menu commands to edit a hierarchy.



A: add new item to list.

Adding is the process of creating a new item (mission, function, etc.). Adding is done by entering "A", typing in the text of the new item, and then pushing "RETURN". If you decide not to add a new item after you have entered "A", press "RETURN" without entering text. New items you enter will be displayed in reverse video.

C: change items in list.

Change is the process of altering an existing item (mission, function, etc.). You change an item by entering "C" (Change), enter the number of the item you want to change, and then type the text of the altered item followed by "RETURN". The changed item is displayed in reverse video.

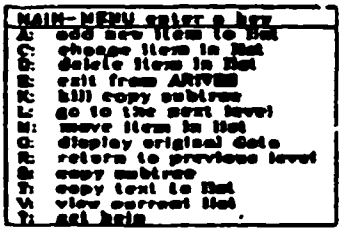
D: delete item in list.

Delete is the process used to remove an item (mission, function, etc.) from an existing list. To delete an item, enter "D" (Delete) and then enter the number of that item. If you decide not to delete an item after entering "D", enter "0" (zero). Deleted items are displayed as blank lines in reverse video.

E: exit from ARIVES.

Enter "E" to exit from ARIVES. This is the only safe way to exit from ARIVES. This is true for all of the ARIVES modules. ***All other exits will produce scrambled data.***

You should be aware that ARIVES applies different exit rules to your subject matter experts (SME) than it does to you. In the EXPERT module an SME will be asked if he has completely finished work. If the SME answers this positively, his work will be automatically sent to a database, and he will not be allowed back into ARIVES without special permission of the database administrator. If he



answers no (anything other than "Y" for yes is no), he will be allowed back into ARIVES. Upon answering this question "Y", he will be logged off the host VAX.

K: kill copy subtree.

If you want to deselect an item that you had previously selected to receive a subtree, and you have not yet copied a subtree to it, enter "K" for kill. This can be done at any time. See the description of the Select command, for a description of the process that Kill deselects.

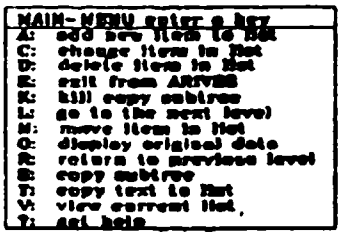
L: go to the next level.

When you are looking at a screen that displays numbered missions and you want to view or work on the functions of a specific mission, enter "L" (Level). After you enter "L", you enter the number of the mission whose functions you wish to work on or view. When you move down the hierarchy below the level of functions you will have to decide which of the following you wish to work on or view for that function:

1. Operational tasks
2. Classes of conditions applying to operational tasks
3. Scheduled maintenance tasks
4. Classes of conditions applying to scheduled maintenance tasks
5. Unscheduled maintenance tasks
6. Classes of conditions applying to unscheduled maintenance tasks

M: move item in list.

If you want to move an item (mission, function, etc.) on a list from one position to another, you can do so using the move command. You first enter "M". Next you enter the number of the item you



want to move. Finally, enter the number of the item before which you want to place the item you are moving. That is, to move an item from position 10 to position 5, enter 10; then enter 5. The former resident of position 5 will now be in position 6. If you want to move an item to the last position in the list, enter "X". Once you have selected the item to be moved, but have not yet moved it, you can cancel this process by entering "0" (zero) rather than a new position number.

O: display original data.

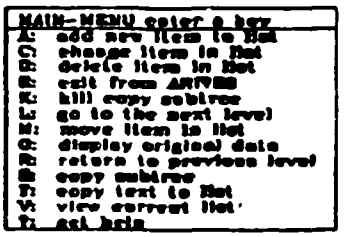
ARIVES allows you to add, delete, or change items. However, it retains a copy of the original, unchanged items. These original items are always available for viewing. When you enter the letter "O" the screen will display the list of original items. Items that you have not modified will be displayed in ordinary video. Items that you have changed or deleted will be replaced by the original line of text and displayed in reverse video. Items that you have added will be replaced by a blank line that is displayed in reverse video.

R: return to previous level.

If you have moved down the hierarchy using the "L" (level) command, you may want to move back up the hierarchy. This is done with "R" (return) command. Entering "R" moves you one level back up the hierarchy. You may enter "R" as many times as you wish until you reach your original mission screen.

S: copy subtree.

A drawing of the ARIVES taxonomy would look like an upside-down tree that consists of parent nodes connected by branches to its children. One subtree consists of a parent node, and its children. For example, a mission is a parent node, and its functions are its children nodes.



A function is a parent node, and its tasks and conditions are its children nodes. When you first add a node, it is a parent and has no children. You can add children one at a time using "A", or you can add a whole subtree by copying from a similar item which is at the same level, but which can be from a different list. Once you have copied a subtree, you can edit it in the usual way.

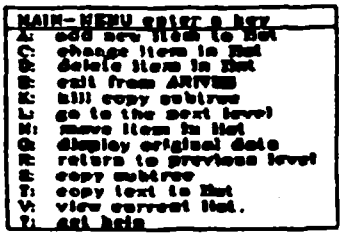
To copy a subtree, enter "S", then enter the number of the item that has no subtree. At this point you can look for an appropriate subtree of an item in the current list, or in any other list at the same level of the hierarchy. When you have found one, enter "S" again and enter the number of the item whose subtree you have picked. Because copying a subtree can take a long time, when you are at the mission level *only the function list is copied.* Then you are given the choice of copying all the task and condition subtrees below the functions, copying some of them individually, or copying none.

T: copy text to list.

Text is a command that is used for copying individual items, at the same hierarchical level, from one subtree to another. For example, if you use Text to display tasks, all the tasks of all the functions of all the missions of the hierarchy will be available to you to copy. To use this feature, enter "T" (Text), then enter the index number of the item you want to copy. Text applies to any level of the hierarchy. In effect, it is a way to cut horizontally across a vertical hierarchical structure. This method is available to the ARIVES analyst to speed up the creation of new hierarchies. It is not available to subject matter experts.

V: view current list.

Before you first edit an ARIVES hierarchy, "View" is the command that allows you to see the items in



the hierarchy (missions, functions, etc.) when the Main Menu is being displayed. To use the view command, enter "V" (View). You can page forward through a list by using "1" and back by using "2". "P" (Path) will display the hierarchic path to the level you are viewing.

Once you have started editing an hierarchy, ARIVES creates a specific user version of that edited hierarchy. However, the original one is still available to you. Under this circumstance, "V" (View) is the command that allows you to see your edited hierarchy when the original one is being displayed. When you display your edited hierarchy, all the items that have been added or changed will be shown in reverse video. Items that have been deleted will be displayed as a blank, reverse video line.

?: get help.

If you want to see the HELP menu, enter "?". From this menu you can choose to obtain more information about any of the Main Menu commands.

Converting the Taxonomy into an MDB for Experts

After you have finished editing an existing hierarchy, creating a new one from scratch, or copying a hierarchy and changing its name, you will want to make your new hierarchy available to SMEs. This assumes you have used the load command for your new hierarchy, as well. Before your SMEs can use the hierarchy, you must convert it to a Master Data Base (MDB). This will convert all user data to original data and clean out all the deleted and old changed items. To turn your new hierarchy into an MDB, do the following.

1. If you have just finished loading your new hierarchy, enter the EXIT command-"E". You will now have access to the ARIVES Directory.

2. If you have previously loaded your new hierarchy, sign on the VAX, and enter "SET DEFAULT ARIVES_DIR" to get to the ARIVES Directory.

Before you execute step 3, you should realize that it may take several hours to run. That means the database on the VAX will be tied up all this time.

3. Enter "PERM NEW_NAME", where NEW_NAME is the name of your new hierarchy.

ENROLLING SUBJECT MATTER EXPERTS

For your SMEs to gain access to ARIVES, you must take some actions. These actions will vary depending upon whether a given SME already has an account on your VAX. For SMEs who have have accounts, skip the following step 1.

1. Contact your System Administrator and have him or her create a VAX account sufficient to access ARIVES for each SME who does not have one.

2. Have the System Administrator assign the following quotas, at a minimum, to each new or existing SME account.

Timer Queue Entry Quota	: 10
Paging File Quota	: 20,000
Enqueue Quota	: 60
Open File Quota	: 60
Ast Limit	: 22

It may be possible to run with less in the way of Timer Queue Entry Quota and the Ast Limit, but the other three are known to require the above levels. The software is known to run correctly with the above.

3. Have the System Administrator copy ARIVES.COM and EXPERT.COM into each SMEs home directory. If it is desired to limit an SME to working on ARIVES only, have the System Administrator make this a Captive Account. In this case, the Administrator should rename EXPERT.COM to LOGIN.COM. (The System Administrator should know what a Captive Account is.)

4. Sign on the VAX.

5. Enter "SET DEFAULT ARIVES_DIR" to get to the ARIVES Directory.

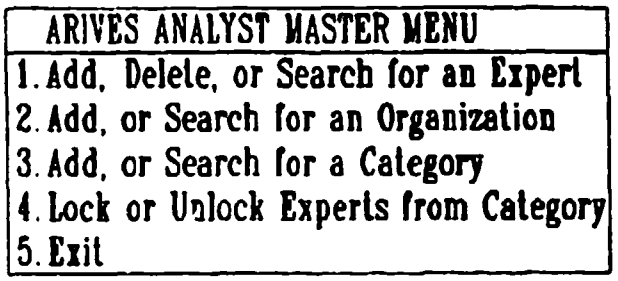
6. For each SME, you must create a work area which makes space for the system category. To do this Enter "CREATE_EXP ARMOR SME_name" for each SME, where ARMOR is the name of the hierarchy, and SME_name is the first and last name of a given SME. Notice that the first and last names must be connected with an underline. The use of SMEs names as account names must be coordinated with your VAX system manager.

7. Log off the VAX

8. Log on the VAX as the ARIVES Analyst as follows:

USERNAME: "your name/COMMAND=ANALYST"
PASSWORD: "your regular password"

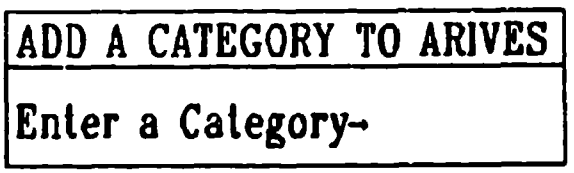
The following menu is displayed:



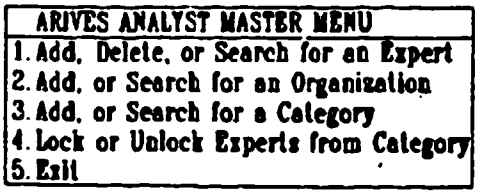
9. If this is a new system category (in this example, armor), now you have to add it to ARIVES. To do so select option 3 above.

10. When you select option 3, the following menu is displayed.

11. Select option 1, above. When you do this, the following prompt is displayed.



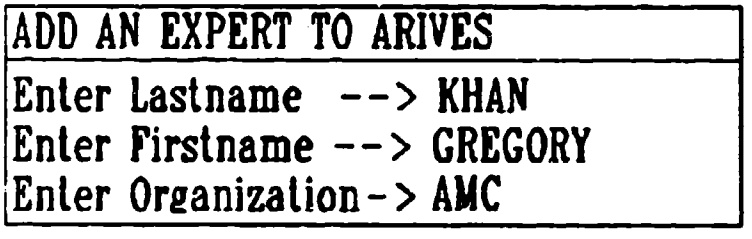
12. Enter the name of the system category (for example, armor) that you wish to add, and press the return key.



13. Upon entering a category, you will be returned to the Category Actions Menu. Select option 3 to exit or option 1 to add another category. If you section option 3, you will be returned to the ARIVES Analyst Master Menu. You can exit from this menu, or you can add, delete, or display subject matter experts who are to be given access to this weapon system category.

14. Select option 1. The next menu displayed is:

15. Again, select option 1. You will see a message asking for the SMEs name and organization, as follows:



For lastname, enter the "SMEs VAX ACCOUNT NAME". *If this is different from his real last name, use it anyway. Otherwise the software will not perform properly.*

ARIVES ANALYST MASTER MENU
1. Add, Delete, or Search for an Expert
2. Add, or Search for an Organization
3. Add, or Search for a Category
4. Lock or Unlock Experts from Category
5. Exit

ARIVES ANALYST EXPERT ACTIONS MENU
1. Add an Expert
2. Delete an Expert
3. Display an Expert
4. Exit

16. After the above information is entered, the following menu will appear. The categories that are displayed depend on those that have been created and stored in the ARIVES Directory. When you select a category, it gives that SME access to the selected hierarchy.

AVAILABLE CATEGORIES
1. Infantry
2. Artillery
3. Armor

17. Select a category by entering its index number, in this case 3.

18. This will complete the enrollment process for that SME. If you want to enroll a second SME, again select Add an Expert. If you are finished, select the EXIT option. The SME can now work on the ARIVES system.

USING THE SME DATA COLLECTED WITH ARIVES

Displaying SME data

The ARIVES analyis display module is based upon the same hierarchical structure as that previously described. Each item (mission, function, etc.) of the hierarchy has SME or statistically produced data attached to it. You can choose to see data and statistics from a specified SME organization, or from all responding SMEs. The following classes of data are available at each item of the hierarchy:

1. The number and percentage of SMEs deleting items;
2. The number and percentage of SMEs changing itmes;
3. All changes recommended by SMEs;

4. The number of SME changes, deletions, and additions to items in the subtree below this item (also called SME activity);
5. The SME name and organization associated with each change and deletion.

For each grouping of items in the hierarchy (missions, functions of a given mission, tasks of a given function, etc.), additions are presented. The names and organizations of the originating SME is attached to each addition.

Using the Analysis Module

1. Sign on the VAX.

2. Enter "@ARIVES" at the $ prompt. You use @ARIVES only the first time you start ARIVES in a given VAX session. In a given VAX session once you exit ARIVES, to restart it you must enter "SET DEFAULT ARIVES_DIR".

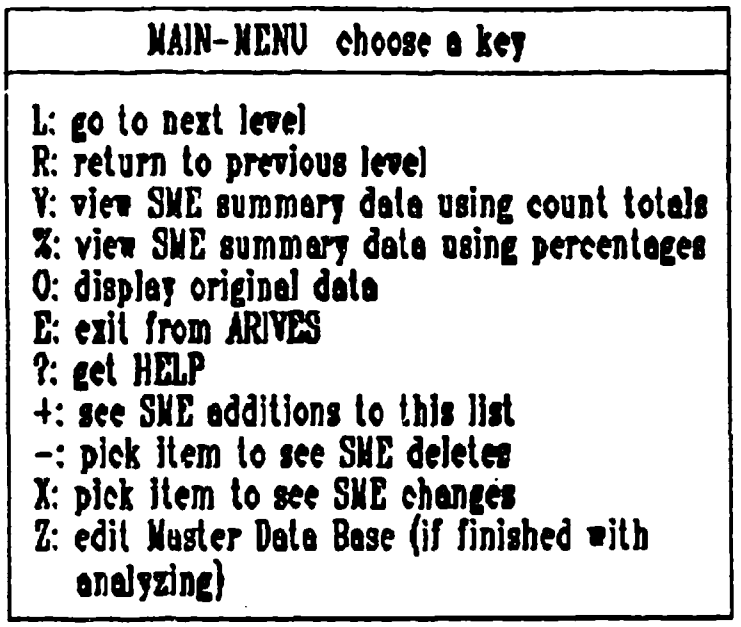
3. You will see some messages that say that various previous values of some ARIVES files have been superceded. This is a normal ARIVES process. You are now in the working area in which ARIVES resides.

4. Enter "ANA name", where name is the name of the hierarchy that you want to examine, such as "armor".

5. ARIVES will display a list of all the organizations whose SMEs have been given access to this particular ARIVES hierarchy. Each organization will have an index number.

6. ARIVES captures the numbers and percentages of SMEs per organization who have finished their work and returned it. You can enter an organization's "index number" or select "all organizations". When you do this, ARIVES will display the number and percentage of response per selected organization. You can use this information to decide whether to look at response data, or wait until more data have been returned.

7. At this point, if you enter the "space bar", ARIVES will offer you the choice of entering at the top of the hierarchy, or at the screen from which you last exited. ARIVES displays the analysis main menu for the either the top of the hierarchy or that level of the hierarchy from which you last exited.



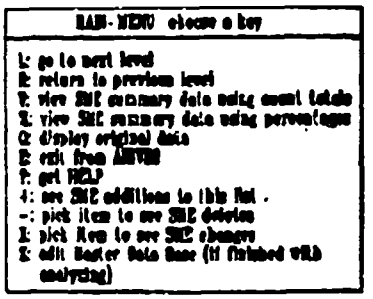
The following consists of descriptions of each of the items on the analysis main menu.

L: go to next level.

If you are looking at a screen that displays missions and you want to view or work on the functions of a specific mission, enter "L" (level). After you enter "L", you enter the number of the mission whose functions you wish to work on or view. When you move down the hierarchy below the level of functions you will have to decide which of the following you wish to work on or view for that function:

a. Operational tasks
b. Classes of conditions applying to operational tasks
c. Scheduled maintenance tasks
d. Classes of conditions applying to scheduled maintenance tasks
e. Unscheduled maintenance tasks
f. Classes of conditions applying to unscheduled maintenance tasks

After moving down the hierarchy using the "L" (level) command, you may want to move back up the hierarchy. This is done with the "R" (return) command. Entering "R", moves you one level back up the hierarchy. You may enter "R" as many times as you wish until you reach your original mission list.



V: view SME summary data using count totals.

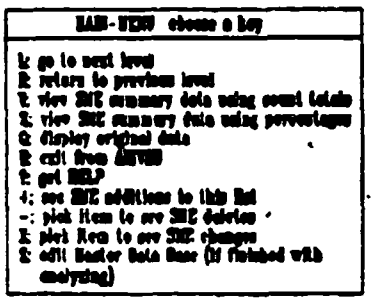
When you enter "V", you will see the following display with actual numbers (instead of percentages) appropriate to your particular analysis. There are two classes of information provided by this display: (1) Decisions your SMEs made about the items at the particular level of the hierarchy to which the display applies. In this case--the mission level is described. (2) How many additions, deletions, and changes were made by SMEs at each branch of the hierarchy below the level currently being displayed. The reason for this second class of information is to help you decide which branches of the hierarchy to ignore, and how to prioritize the remaining branches. ARIVES refers to this second class of information as SME activity level.

MISSION LIST: USER DATA

1> Destroy enemy armored vehicles.
Changes:#:#below:Highest#= 7; 52; 25; Add: Next Level Down = 5
Deletes:#: #Below:Highest#= 1; 266; 1; Add: All Levels = 20

2> Destroy fortifications.
Changes:#:#Below:Highest#= 0; 1; 1; Add: Next Level Down = 0
Deletes:#:#Below:Highest#= 0; 763; 45; Add: All levels = 1

In this particular example, for the first mission 7 SMEs have recommended changing the mission. SMEs have recommended 52 changes for items in the subtree below this mission. The item in this subtree that was changed the most was changed by 25 SMEs. One SME deleted this mission. There are 256 deletions in the subtree below this mission, but the largest number of SMEs that deleted any single item was one. There have been five new items added to the next level of the



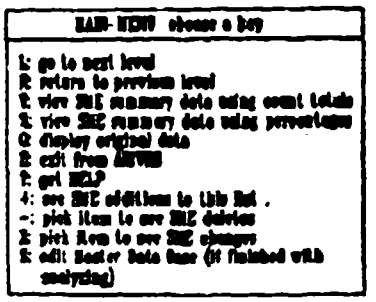
hierarchy below this specific mission. There have been 20 new items added to all levels of the hierarchy below this specific mission.

Deleting an item in a hierarchy also deletes all the items below it that are connected to it. This means that when an SME deletes an item, ARIVES counts not only this deletion, but all the items below it that have automatically been deleted. For example, in the mission--"Destroy enemy armored vehicles," all 256 deletions in the subtree were caused by one SME deleting the parent mission. However, in the second example--"Destroy fortifications," no SME chose to delete the parent mission; but there are 763 deletes in the subtree below it, and one item was deleted by 45 experts. This example is for the mission level, but there is an equivalent display for all levels of the ARIVES hierarchy.

There are a few exceptions to the general rule of equivalent displays for all levels of the hierarchy. At the function level, "ADD: Next Level Down" presents no information, although "All Levels" information is given. The reason for this is that from the point of view of the ARIVES software, operations tasks, maintenance tasks, operations conditions and maintenance conditions are all at the same level of the hierarchy immediately below their parent function. At the task and individual conditions levels, all summary statistics that refer to lower levels will always be zero, since the hierarchy does not go any further down.

%: view SME summary data using percentages.

When you enter "%", you will see the SME data expressed as percentages of the total number of SMEs responding.



O: display orginal data.

ARIVES allows you to add, delete, or change items. However, it retains a copy of the original, unchanged items. These original items are always available for viewing. When you enter "O," the screen will display the list of original items. Items that you have not modified will be displayed in ordinary video. Items that you have changed or deleted will be replaced by the original line of text and displayed in reverse video. Items that you have added will be replaced by a blank line that is displayed in reverse video.

E: exit from ARIVES.

Enter "E" to exit from ARIVES. This is the only safe way to exit from ARIVES. This is true for all of the ARIVES user's modules. ***All other exits will produce scrambled data.***

?: get HELP.

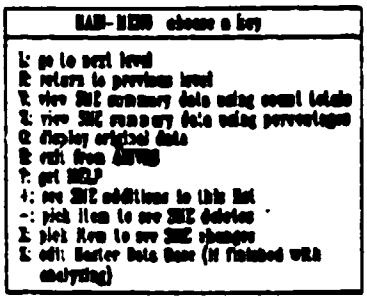
If you want to see the HELP menu, enter "?". From this menu you can choose to obtain more information about any of the Main Menu commands.

+: see SME additions to this list.

When you enter "+" from the summary statistics display, ARIVES will display the list of additional items suggested by the SMEs to the currently displayed list of missions, functions, etc. To display summary statistics that apply to additional items, you must first enter "+".

-: pick item to see SME deletes.

When you enter "-" and select a deleted item, you will see the list of SMEs who deleted it.



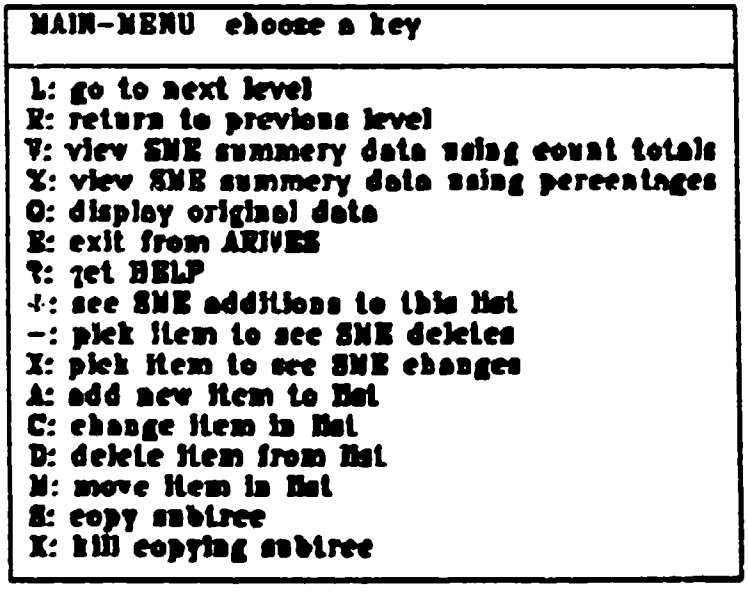
X: pick item to see SME changes.

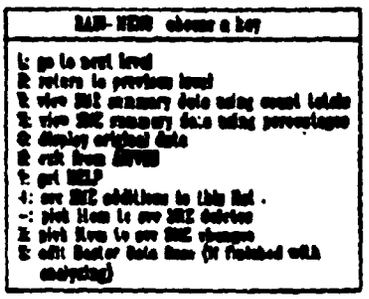
When you enter "X" and select a changed item, you will see the list of changes made to that item by the SMEs. Each change is accompanied by its author's name and organization.

Z: edit Master Data Base (if finished with analysis).

When you enter "Z", you can modify the Master Data Base. When you choose to do this, there will be some very serious consequences.

No further work by the SMEs on this type of system can be done after you start modifying. This means that statistical information about the SMEs' decisions concerning the data base will be fixed at that point. Entering "Z", results in the display of the following analyst's editing menu. It can be brought up at any time during an editing session by entering the "SPACE-BAR".





All commands work in the same way as previously described with one exception. After you use "+", "-", or "X" to view SME suggestions, if you wish to accept a suggestion, you must enter "A" for accept. ARRIVES will prompt you for this command whenever it is applicable.

CONVERTING THE VALIDATED DATABASE TO AN MDB

When you have *completely* finished editing the original Master Data Base according to the SME input, you may want to use this validated database, or you may want to send it out to SMEs again for another round of validation. To do this, you must convert it to a new Master Data Base.

1. Sign on the VAX.

2. Enter "@ARIVES" at the $ prompt. You use @ARIVES only the first time you start ARIVES in a given VAX session. In a given VAX session once you exit ARIVES, to restart it you must enter "SET DEFAULT ARIVES_DIR".

3. You will see some messages that say that various previous values of some ARIVES files have been superceded. This is a normal ARIVES process. You are now in the working area in which ARIVES resides.

Before you execute step 4, you should realize that it may take several hours to run. That means the database on the VAX will be tied up all this time.

4. Enter "NEW NAME", where name is the name of your hierarchy.

WHAT TO DO IF SOMETHING UNFORTUNATE HAPPENS

Computers are not 100% reliable. Neither are computer programs. Power surges or failures, air conditioning failures, and operating system difficulties can cause a computer system to go down without warning. It is also possible that there are undiscovered bugs still in the ARIVES software.

If the system crashes, you should just start your next session when the system becomes available. If an SME makes the mistake of answering yes that work is finished, when it is not (thereby closing his access to ARIVES), he should contact the ARIVES analyst for help.

If the data in the taxonomy looks as if it was messed up by a program bug, the ARIVES analyst should inform the VAX system manager as soon as possible. It would be very helpful if he can explain exactly what he or the SME was doing before the problem appeared and why a problem is suspected. If the VAX system manager cannot solve the problem, it should be referred to the developers at ARI.

If either the host system, on which ARIVES resides, or the terminal that you are using to access ARIVES fails, you lose the results of the current session. However, since ARIVES backs up each session at login, you will return after a failure to the state ARIVES was in before your last session. *To avoid a major data loss, a safer method of working on ARIVES is to work during several short sessions rather than one long session. When you exit from ARIVES, it will save your work, automatically.*